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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/056,275	01/23/2002	Irina Medvedev	020038	8555

23696 7590 10/20/2004

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Patents Department
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EXAMINER	
PEREZ, ANGELICA	
ART UNIT	**PAPER NUMBER**
2684	

DATE MAILED: 10/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/056,275	MEDVEDEV ET AL.	
	Examiner	Art Unit	
	Angelica M. Perez	2684	E

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 January 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-26,32-38 and 40-43* is/are allowed.

6)☒ Claim(s) *27-31,39 and 44-47* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *5*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

1. The following is an examiner's statement of reasons for allowance:

Regarding claims 1, 14, 32, 33, 34, 35 and 40, the previous art teaches of a method, a controller for allocating transmit power to a plurality of transmission channels in a multiple-input multiple-output (MIMO) wireless communication system, a memory coupled to a digital signal processing device (DSPD) capable of interpreting digital information, a computer program, an apparatus and a transmitter unit comprising: defining a set of one or more transmission channels to be allocated transmit power; determining a total transmit power available to allocate to the transmission channels in the set; allocating the total transmit power to the transmission channels in the set based on a particular allocation scheme, identifying transmission channels in a saturation region resulting from the allocated transmit power; reallocating each transmission channel in the saturation region with a revised I amount of transmit power; determining a total excess transmit power for all transmission channels reallocated with revised amounts of transmit power. Also, the previous art teaches of one or more iterations.

The previous art fails to teach of one or more iterations, where the set of transmission channels for a first iteration includes the **plurality of transmission channels** and **for each subsequent iteration includes transmission channels not in the saturation region**, and where the total transmit power available for each subsequent iteration includes the **total excess transmit power determined in a current iteration.**

Regarding claims 16 and 38, the previous art of record teaches of a method for allocating transmit power to a plurality of transmission channels in a wireless communication system, comprising: identifying a first set of transmission channels to be allocated transmit power; determining a total transmit power available to allocate to the transmission channels in the first set; based on a particular allocation scheme; identifying a second set of one or more transmission channels allocated excessive transmit power for preferred operating points;

The previous art fails to teach of allocating each transmission channel in the **second set with a revised amount of allocating the total transmit power** to the transmission channels in the first set transmit power to achieve the preferred operating point; determining a **total excess power for all transmission channels in the second set**; identifying a **third set** of one or more transmission channels **capable of supporting higher preferred operating points**; and **reallocating the total excess power to the one or more transmission channels in the third set.**

Claims 2-13, 15, 17-26, 36-37 and 41-43 are dependent upon claims 1, 14, 16, 32, 33, 34, 35, 38 and 40; therefore, the examiner gives the same reasons for allowance as discussed above.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 27-31 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bae (Bae et al.; US Patent No.: 5,832,387 A) in view of Nystrom (Nystrom et al.; US Patent no.: 6,334,058 B1).

Regarding claim 27, Bae a method for allocating transmit power to a plurality of transmission channels in a wireless communication system (column 1, lines 8-13), comprising: determining a total transmit power available to allocate to the transmission channels (column 3, lines 14-15; where the sum of individual powers of individual sub-channels, provide the total power for all channels); allocating the total transmit power to the transmission channels in the set based on a particular allocation scheme (column 3, lines 15-18; where the particular scheme where: "higher power value is allocated to a sub-channel having a higher SNR, and a lower power value is allocated to a sub-cannel having a lower SNR"); determining an excess spectral efficiency based in part on the transmit power allocated to the transmission channels (column 3, lines 18-20; where, "...exceeds the maximum transmission power limit"; where if the transmission limit is exceeded, the spectral efficiency does, too); and reallocating one or more transmission channels with reduced amounts of transmit power to reduce the excess spectral

efficiency (column 3, lines 24-25; where the "redetermining" corresponds to "reallocating").

Bae does not specifically teach of means for identifying a set of transmission channels to be allocated transmit power.

In related art, Nystrom teaches of means for identifying a set of transmission channels to be allocated transmit power (column 2, lines 62-66 and column 1, lines 51-54; where the identified channels are determined by the cells).

It would have been obvious to a one of ordinary skill in the art at the time the invention was made to combine Bae's power controller for the allocation of power to a plurality of channels with Nystrom's means for identifying a set of transmission channels in order to control a maximum output power in the system, as taught by Nystrom.

Regarding claim 28. Bae in view of Nystrom teaches all the limitations of claim 27. Bae further teaches of reducing the transmit power allocated to each transmission channel to achieve a preferred operating point (column 3, lines 14-18; where the power adjustment goal is to obtain an optimum or preferred operating point).

Regarding claim 29. Bae in view of Nystrom teaches all the limitations of claim 27. Bae further teaches of determining incremental changes in spectral efficiency for a plurality of transmit power reductions for the transmission channels; and selecting a largest transmit power reduction associated with an incremental spectral efficiency change that is less than or equal to the excess spectral efficiency (column 3, lines 18-20; where, "...exceeds the maximum transmission power limit"; where if the

transmission limit is exceeded, the spectral efficiency does, too. Moreover, optimization of power procures a change that is less than or equal to the excess spectral efficiency).

Regarding claim 30, Bae in view of Nystrom teaches all the limitations of claim 27. Bae further teaches of determining a backed-off transmit power; and allocating the backed-off transmit power to the transmission channels in the set.

Regarding claim 31, Bae in view of Nystrom teaches all the limitations of claim 30. Bae further teaches of performing the determining the backed-off transmit power and the allocating the backed-off transmit power one or more times until the excess spectral efficiency is within a particular threshold.

Regarding claim 39, Bae teaches of a controller in a wireless communication system (figure 8, item 712), comprising: means for determining a total transmit power available to allocate to the transmission channels (column 3, lines 14-15; figure 8, item 708); means for allocating the total transmit power to the transmission channels in the set based on a particular allocation scheme column 3, lines 15-18; where the particular scheme where: "higher power value is allocated to a sub-channel having a higher SNR, and a lower power value is allocated to a sub-cannel having a lower SNR"; figure 8, item 708 and 706; where the power is allocated according to SNR values); means for determining an excess spectral efficiency based in part on the transmit power allocated to the transmission channels (column 3, lines 18-20; where, "...exceeds the maximum transmission power limit"; where if the transmission limit is exceeded, the spectral efficiency does, too); and reallocating one or more transmission channels with reduced

amounts of transmit power to reduce the excess spectral efficiency (column 3, lines 24-25; where the "redetermining" corresponds to "reallocating").

Bae does not specifically teach of means for identifying a set of transmission channels to be allocated transmit power.

In related art, concerning a method and apparatus for radio power allocation, Nystrom teaches of means for identifying a set of transmission channels to be allocated transmit power (column 2, lines 62-66 and column 1, lines 51-54; where the identified channels are determined by the cells).

It would have been obvious to a one of ordinary skill in the art at the time the invention was made to combine Bae's power controller for the allocation of power to a plurality of channels with Nystrom's means for identifying a set of transmission channels in order to control a maximum output power in the system, as taught by Nystrom.

4. Claims 44 and 46-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bae in view of Onggosanusi (Onggosanusi et al.; US Pub. No.: 2003/0,139,194 A1); and further in view of Nystrom.

Regarding claims 44 and 47, Bae teaches of a receiver unit in a wireless communication system (figure 8, item 704); where transmit power for the plurality of transmission channels is allocated: based in part on the CSI by allocating a total available transmit power to the plurality of transmission channels based on a particular allocation scheme (column 3, lines 15-18; where the particular scheme where: "higher power value is allocated to a sub-channel having a higher SNR, and a lower power

value is allocated to a sub-cannel having a lower SNR"), reallocating each transmission channel in a saturation region with a revised amount of transmit power (column 3, lines 20-23; e.g., "redetermining").

Bae does not specifically teaches of comprising a receive (RX) MIMO processor operative to receive and process a plurality of streams of samples to provide a plurality of streams of received symbols (paragraphs 0019 and 0023, lines 1-3 and 1-6, respectively), and to derive channel state information (CSI) for a plurality of transmission channels used for the plurality of received symbol streams (paragraph 0006; where closed-loop systems utilize CSI information); and a RX data processor operative to process the plurality of received symbol streams in accordance with one or more demodulation and decoding schemes to provide decoded data (paragraph 0023, lines 1-6; where DSP's perform the processing functions described), and allocating total remaining transmit power to transmission channels not in the saturation region.

In related art, concerning a closed-loop transmit diversity scheme in frequency selective multipath channels, Onggosanusi teaches of comprising a receive (RX) MIMO processor operative to receive and process a plurality of streams of samples to provide a plurality of streams of received symbols (paragraphs 0019 and 0023, lines 1-3 and 1-6, respectively), and to derive channel state information (CSI) for a plurality of transmission channels used for the plurality of received symbol streams (paragraph 0006; where closed-loop systems utilize CSI information); and a RX data processor operative to process the plurality of received symbol streams in accordance with one or

more demodulation and decoding schemes to provide decoded data (paragraph 0023, lines 1-6; where DSP's perform the processing functions described), and :

It would have been obvious to a one of ordinary skill in the art at the time the invention was made to combine Bae's power controller for the allocation of power to a plurality of channels with Onggosanusi's MIMO processor and CSI information in order to optimize multipath interference suppression, as taught by Onggosanusi.

Bae in view of Onggosanusi does not specifically teach of allocating total remaining transmit power to transmission channels not in the saturation region.

In related art, concerning a method and apparatus for radio power allocation, Nystrom teaches of allocating total remaining transmit power to transmission channels not in the saturation region (column 3, lines 23-26; where power is reallocated where it is needed).

It would have been obvious to a one of ordinary skill in the art at the time the invention was made to combine Bae's power controller for the allocation of power to a plurality of channels and Onggosanusi's MIMO processor and CSI information with Nystrom's allocating total remaining transmit power to transmission channels not in the saturation region in order to improve power distribution within a cell, as taught by Bae.

Regarding claim 46, Bae in view of Onggosanusi, and further in view of Nystrom teaches all the limitations of claim 44. Onggosanusi further teaches of a TX data processor operative to process the CSI for transmission back to a transmitter unit (paragraph 0006; where closed-loop systems gets the CSI back to the transmitter).

5. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bae in view of Onggosanusi, further in view of Nystrom, and further in view of Boleskei (Boleskei et al.; US Patent No.: 6,442,214 B1).

Regarding claim 45, Bae in view of Onggosanusi, and further in view of Nystrom teaches all the limitations of claim 44.

Bae in view of Onggosanusi, and further in view of Nystrom does not specifically teach where the RX MIMO processor is further operative to pre-condition the plurality of received symbol streams to diagonalize the plurality of transmission channels.

In related art, concerning a diversity transmitter, Boleskei teaches where the RX MIMO processor is further operative to pre-condition the plurality of received symbol streams to digitalize the plurality of transmission channels (column 6, lines 13-20; where channel diagonalization is present).

It would have been obvious to a one of ordinary skill in the art at the time the invention was made to combine Bae's, Onggosanusi's and Nystrom's combined method with Boleskei's diagonalization of channels in order to divide transmitted data across the available frequency spectrum, as taught by Boleskei.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Reference entitled, "Power-controlled capacity for interfering MIMO links", IEEE Xplore, refers to maximizing channel capacity in MIMO systems utilizing the water-filling algorithm.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Angelica Perez whose telephone number is 703-305-8724. The examiner can normally be reached on 7:15 a.m. - 3:55 p.m., Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nay Maung can be reached on 703-308-7745. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and for After Final communications.

Information regarding Patent Application Information Retrieval (PAIR) system can be found at 866-217-9197 (toll-free).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the TC 2600's customer service number is 703-306-0377.

Angelica Perez
(Examiner)

NAY MAUNG
SUPERVISORY PATENT EXAMINER

Art Unit 2684

October 4, 2004